



*Optimal Solutions for the Future*

# PUMA HT / QL series



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**Twin Spindle Turning  
Center & Gantry  
Loader series**

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**PUMA HT / QL series**

PUMA HT230T / HT230TG  
PUMA H250TM / QL200HM  
PUMA H310T / QL300H  
PUMA H310TM / QL300HM

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ver. EN 160729 SU

# Two Spindle, 4-axes Turning Center Realizes Twice the Productivity

**PUMA HT230T / H310T**  
**PUMA H250TM / H310TM**



# Integral CNC Gantry Loader Ensures Versatile Automation and High Productivity

**PUMA HT230TG / QL300H**  
**PUMA QL200HM / QL300HM**



# Main Spindle



Main spindle is supported by high precision bearing combination with large diameter. All spindle bearing are lubricated by grease.

C-axis contouring provides main spindle positioning in increments of 0.001 degree. Three dimensional contouring, complex round and prismatic machining, square shoulder and lettering are accomplished by synchronizing the spindle with linear axes (on H250TM / H310TM / QL200HM / QL300HM)

## PUMA HT230T / HT230TG series ( 6" class )

Max. spindle speed      Motor ( 30min )  
**4500** r/min      **11** kW  
 ( 14.8 Hp )

## PUMA H250TM / QL200HM ( 8" class )

Max. spindle speed      Motor ( 30min )  
**4500** r/min      **11** kW ( 14.8 Hp )

## PUMA H310T / QL300H series ( 10" class )

Max. spindle speed      Motor ( 30min )  
**3500** r/min      **18.5** kW ( 24.8 Hp )

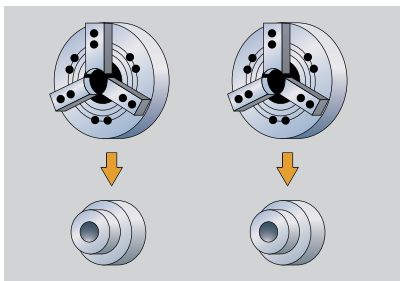
### C-axis control of main spindle

C-axis index  
**360°** ( in 0.001° increment )

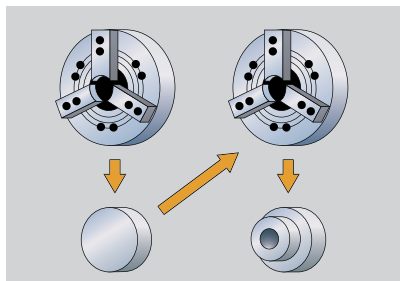
C-axis braking torque  
**141** N·m ( 104.1 ft·lb ) ( H250TM / QL200HM )  
**319** N·m ( 235.4 ft·lb ) ( H310TM / QL300HM )

C-axis contouring torque  
**112** N·m ( 82.7 ft·lb ) ( H250TM / QL200HM )  
**393** N·m ( 290.0 ft·lb ) ( H310TM / QL300HM )

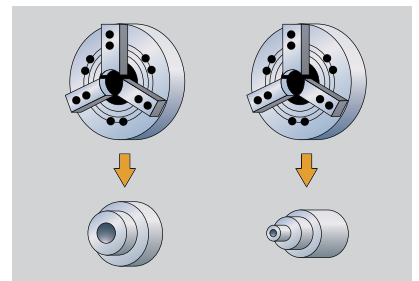
## Machining Application



Turning Identical Parts on Both Spindles



First Step on Left Spindle & Second Step on Right Spindle

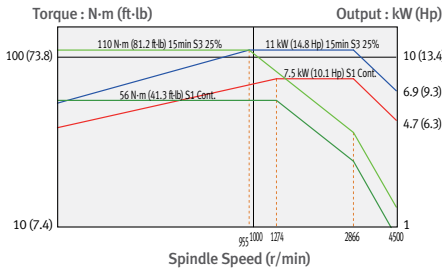


Turning Different Parts on Spindle

# Main Spindle Power-torque Diagram

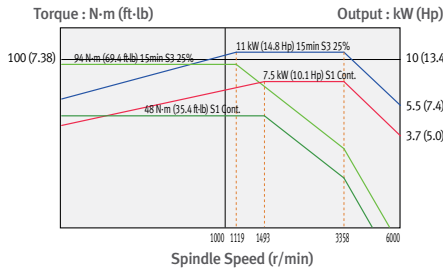
## PUMA HT230T std.

- Max. spindle speed : 4500 r/min
- Motor power : 11 kW (14.8 Hp)



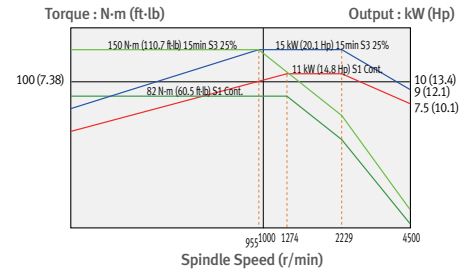
## PUMA HT230T opt.

- Max. spindle speed : 6000 r/min
- Motor power : 11 kW (14.8 Hp)



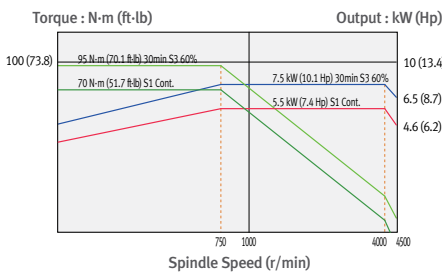
## PUMA HT230T opt.

- Max. spindle speed : 4500 r/min
- Motor power : 15 kW (20.1 Hp)



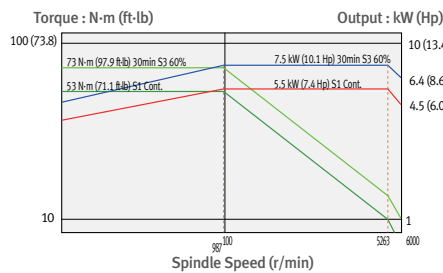
## PUMA HT230TG std.

- Max. spindle speed : 4500 r/min
- Motor power : 7.5 kW (10.1 Hp)



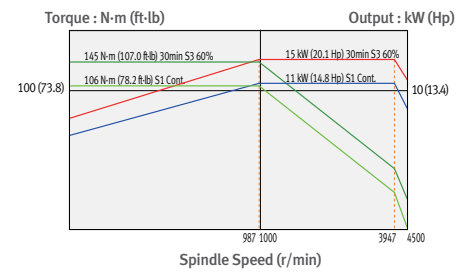
## PUMA HT230TG opt.

- Max. spindle speed : 6000 r/min
- Motor power : 7.5 kW (10.1 Hp)



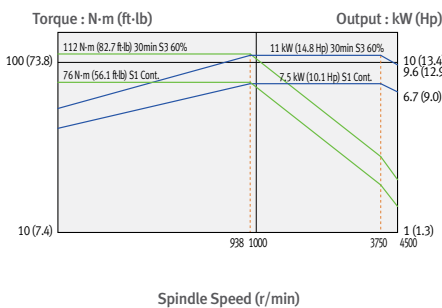
## PUMA HT230TG opt.

- Max. spindle speed : 4500 r/min
- Motor power : 15 kW (20.1 Hp)



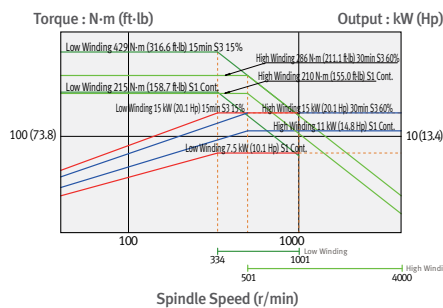
## PUMA H250TM / QL200HM std.

- Max. spindle speed : 4500 r/min
- Motor power : 11 kW (14.8 Hp)



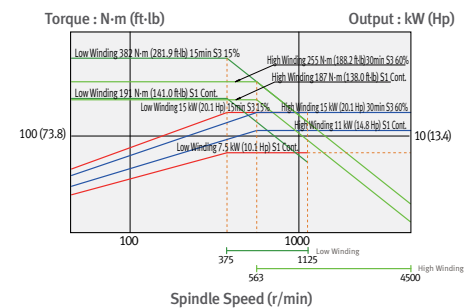
## PUMA H250TM / QL200HM opt.

- Max. spindle speed : 4000 r/min
- Motor power : 15 kW (20.1 Hp) (High / Low winding)



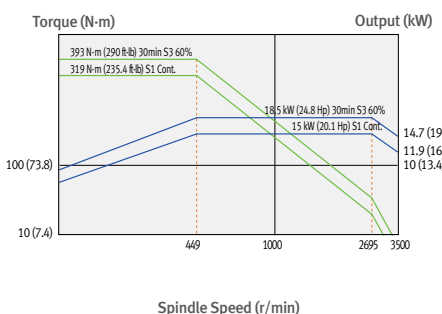
## PUMA H250TM / QL200HM opt.

- Max. spindle speed : 4500 r/min
- Motor power : 15 kW (20.1 Hp) (High / Low winding)



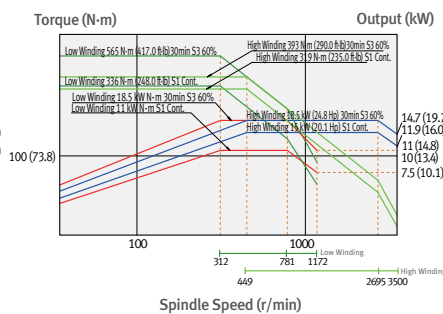
## PUMA H310T [TM] / QL300H [HM] std.

- Max. spindle speed : 3500 r/min
- Motor power : 18.5 kW (24.8 Hp)



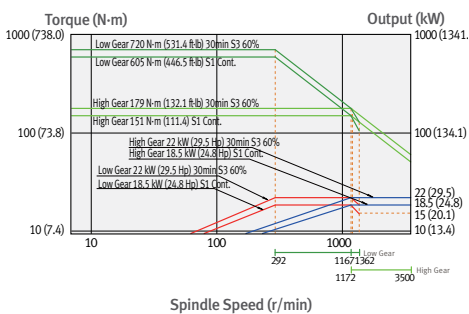
## PUMA H310T [TM] / QL300H [HM] opt.

- Max. spindle speed : 3500 r/min
- Motor power : 18.5 kW (24.8 Hp) (High / Low winding)



## PUMA H310T [TM] / QL300H [HM] opt.

- Max. spindle speed : 3500 r/min
- Motor power : 22 kW (29.5 Hp)



# Turret



The heavy duty design provides unsurpassed rigidity for heavy stock removal, fine surface finishes, Turning tools are securely attached to the turret by wedge clamps.

Index time (1-station swivel)

HT230T / HT230TG : **0.25 s**

PUMA H250TM / QL200HM : **0.28 s**

H310T [TM] / QL300H [HM] : **0.35 s**

2 axis V10 turret

No. of tool station

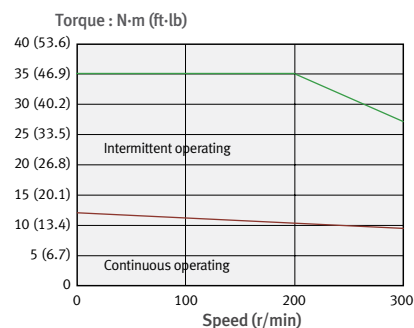
**Left 10 + Right 10**

HT230T / H310T / HT230TG / QL300H

## Rotary tool spindle power-torque diagram

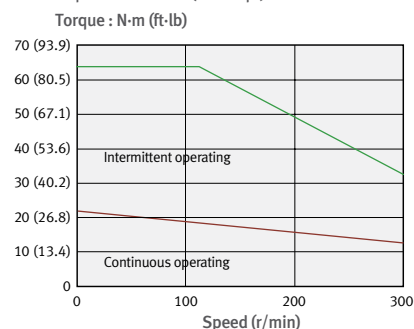
### PUMA H250TM / QL200HM

- Max. tool spindle speed : 3000 r/min
- Motor power : 3 kW (4.0 Hp)



### PUMA H310TM / QL300HM

- Max. tool spindle speed : 3000 r/min
- Motor power : 4 kW (5.4 Hp)



## 3 axis BMT / VDI turret

Total 24 tool stations turret (VDI) make it possible to complete complicated parts requiring many tools in just one set-up.

No. of tool station (H250TM / H310TM / QL200HM / QL300HM)

**Left 12 + Right 12**

H250TM / QL200HM **BMT55**

H310TM / QL300HM **VDI 40**



< BMT turret >

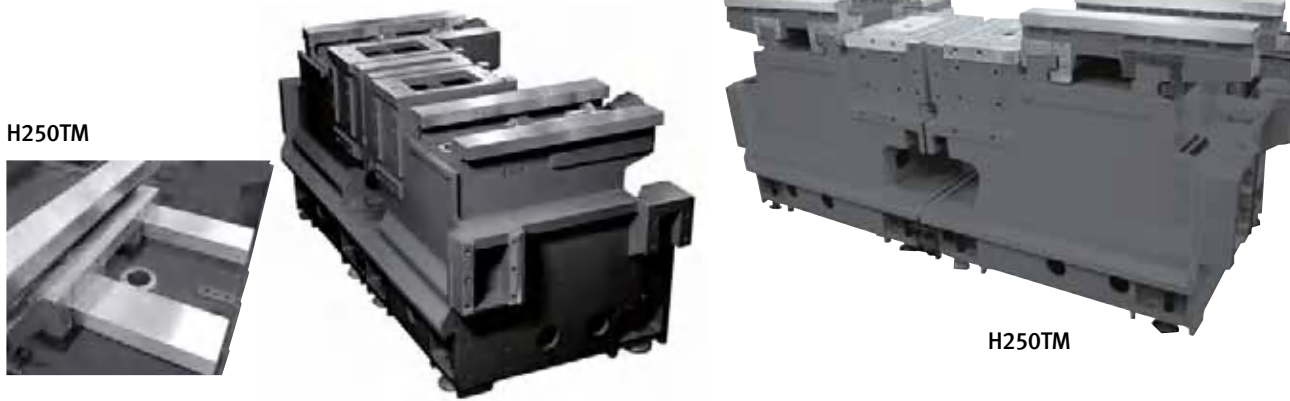


< VDI turret >

## Machine Construction

All guide ways are wide wrap-around rectangular type for unsurpassed longterm rigidity and accuracy

Exclusive bed design provides exceptional accessibility to the chuck for convenient loading / unloading of parts. Separated left and right bed minimizes the effect of vibration in various cutting conditions and realize the high reliability.



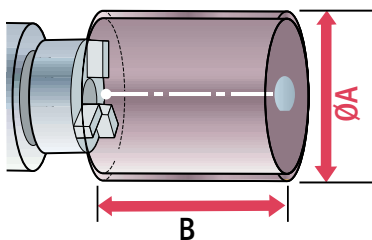
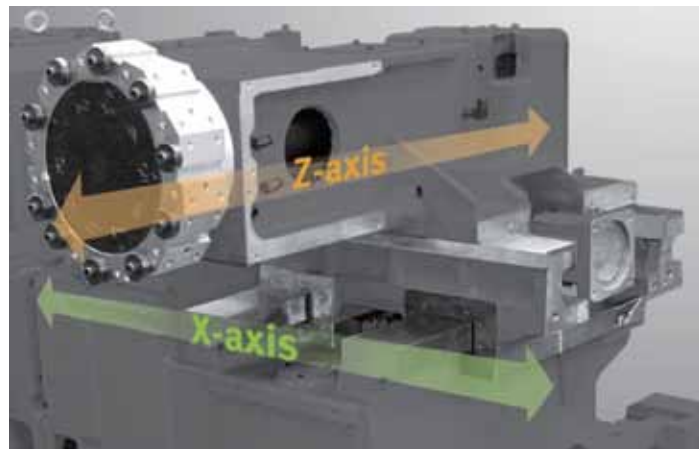
## Working Range

A : Max.turning dia.

- 240** mm (9.4 inch) (HT230T)
- 310** mm (12.2inch) (H250TM)
- 410** mm (16.1 inch) (H310T / TM)

B : Max.turning Length

- 165** mm (6.5 inch) (HT230T)
- 200** mm (7.9 inch) (H250TM)
- 230** mm (9.1 inch) (H310T / TM)



Left and Right side have the same working capacity.

Axis travel

(HT230T / H250TM / H310T)

X-axis **140 / 180 / 210** mm  
(5.5 / 7.1 / 8.3 inch)

Z-axis **165 / 200 / 230** mm  
(6.5 / 7.9 / 9.1 inch)

Rapid travel

(HT230T / H250TM / H310T)

**24** m/min  
(0.9 ipm)

**24** m/min  
(0.9 ipm)

# Gantry Loader Application



PUMA HT230TG / QL200HM / QL300H [HM]

**Twin spindles and Twin turrets**  
**The machine realizes high productivity**

From transmissions to four corner components which have any different shape, size and capacity are capable to be manufactured by Gantry Loader System.



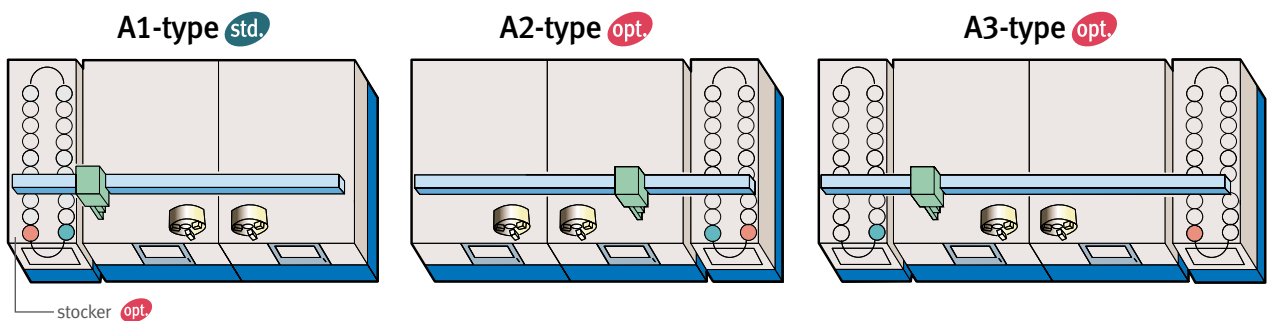
FOUR CORNERS



TRANSMISSIONS



## Variation of Gantry Loader Application ( PUMA HT230TG / QL200HM / QL300H [HM] )



( ● Loading position, ● Unloading position )



## Gantry Loader

### Axis travel of Gantry loader\*

PUMA HT230TG / QL200HM / QL300H [HM]

X-axis **1850 / 2010 / 3105** mm  
(72.8 / 79.1 / 122.2 inch)

Y-axis **545 / 700 / 945** mm  
(21.5 / 27.6 / 37.2 inch)

Z-axis **180 / 200 / 200** mm  
(7.1 / 7.9 / 7.9 inch)

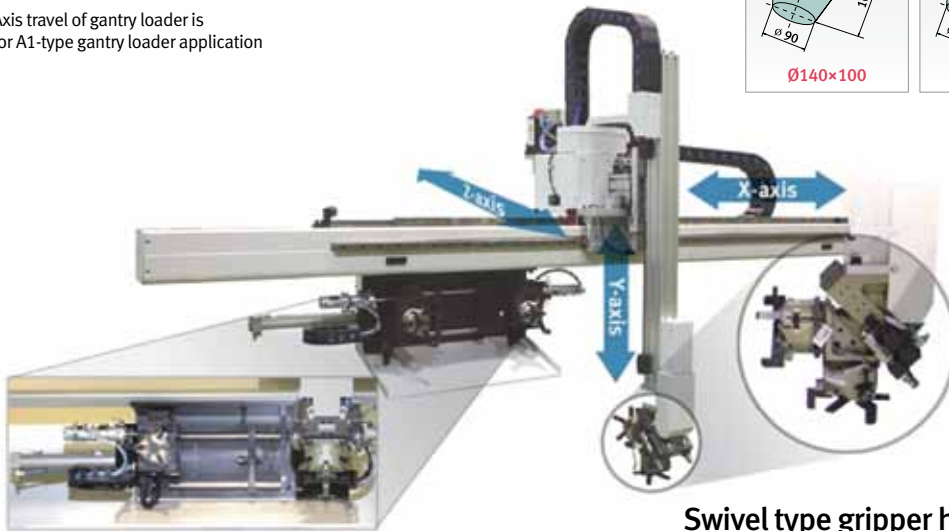
\* : Axis travel of gantry loader is for A1-type gantry loader application

### Servo driven CNC gantry loader

PUMA HT230TG / QL200HM / QL300H [HM]

: 3-axis Servo driven (X, Y, Z)

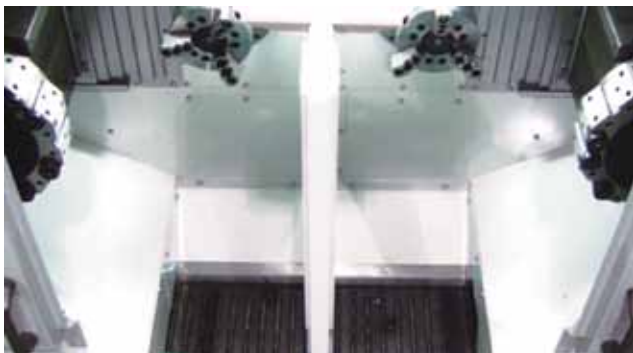
Max. G-Loader Handling Size (Max. turning dia.×Max. turning length)		
<b>PUMA HT230TG</b>  <b>Ø140×100</b>	<b>QL200HM</b>  <b>Ø160×115</b>	<b>PUMA QL300H/HM</b>  <b>Ø250×150</b>



Swivel type gripper head  
Wrist swivel angle : **180°**

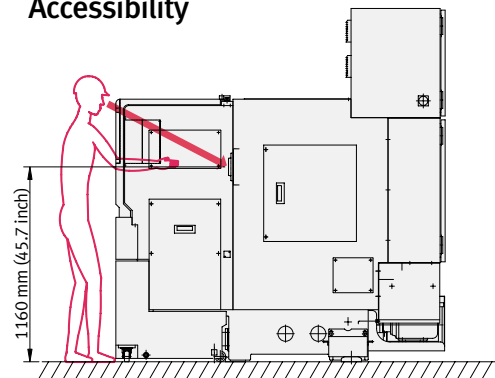
## Ergonomic Design

### Easy chip disposal



A large capacity chip pan is installed separately from the machine bed so that heat generated by cut chips will not distort the bed. The large coolant capacity allows a constant coolant temperature to be maintained for precision machining.

### Accessibility

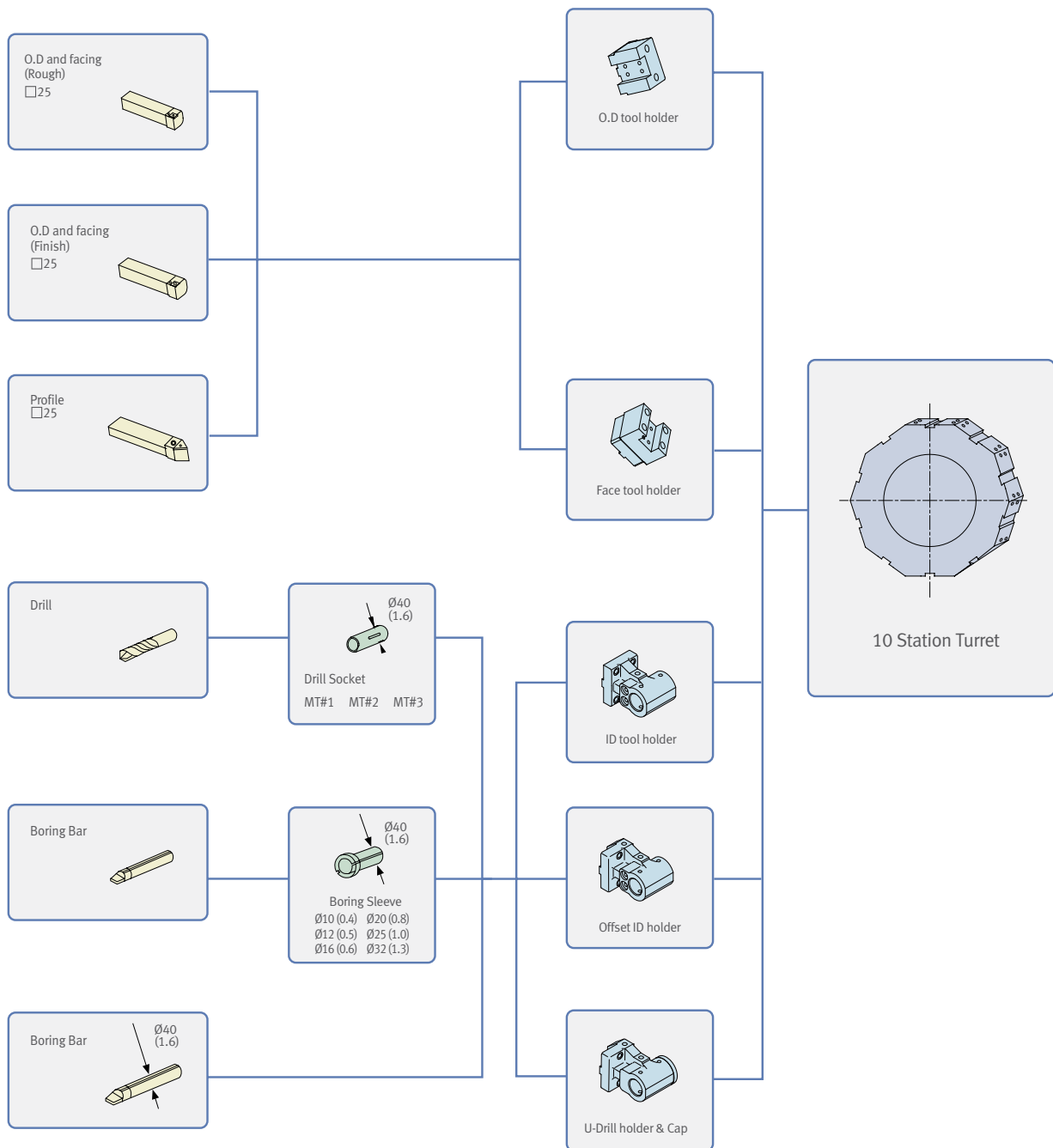


Easy accessibility to setup work pieces and tools which ensures operation efficiency.

# Tooling System

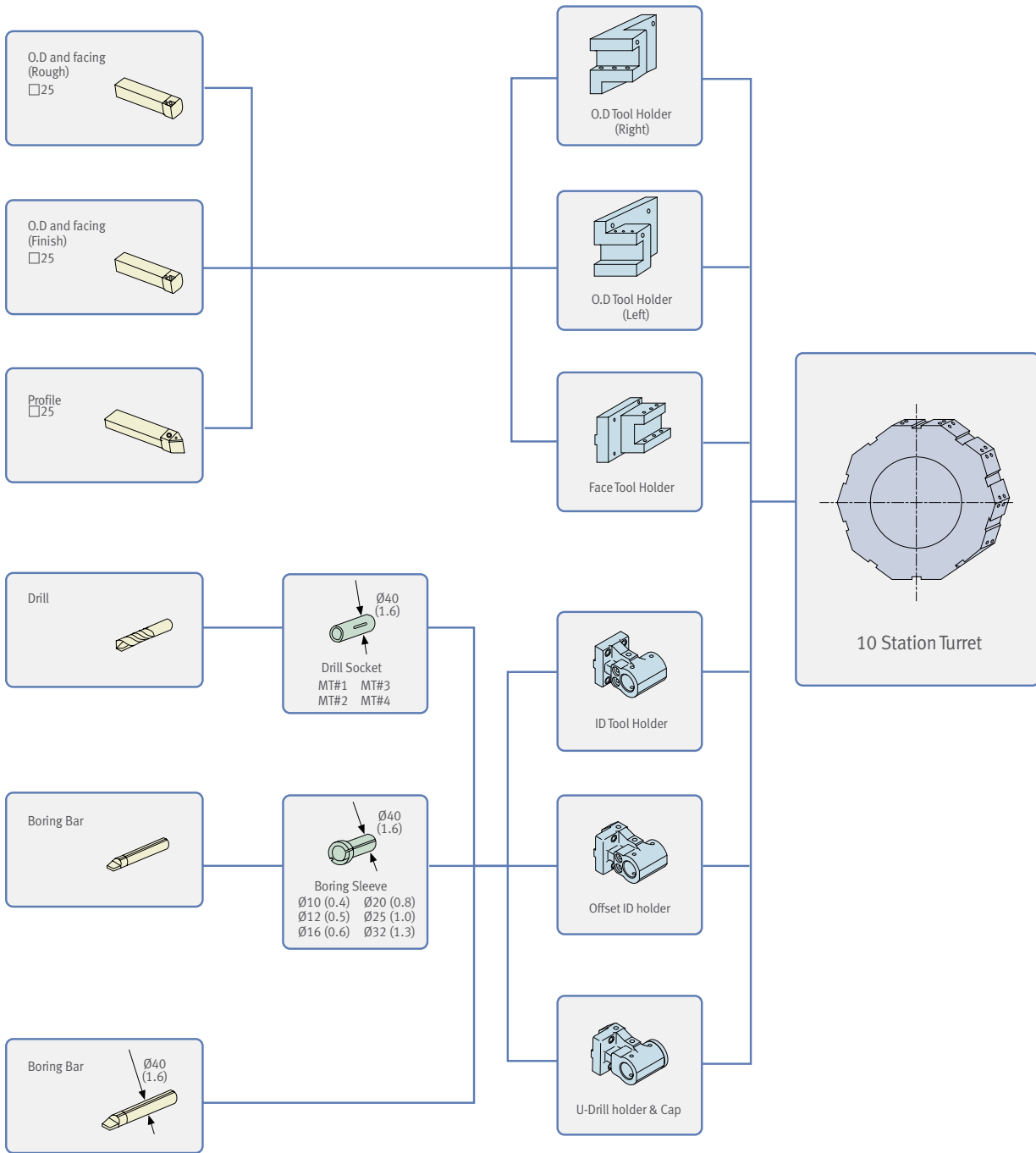
unit : mm (inch)

## PUMA HT230T / HT230TG



Note) Above tooling system is our recommendation. Depending on export condition, the standard tooling packed with the machine can be different.

# PUMA H310T / QL300H

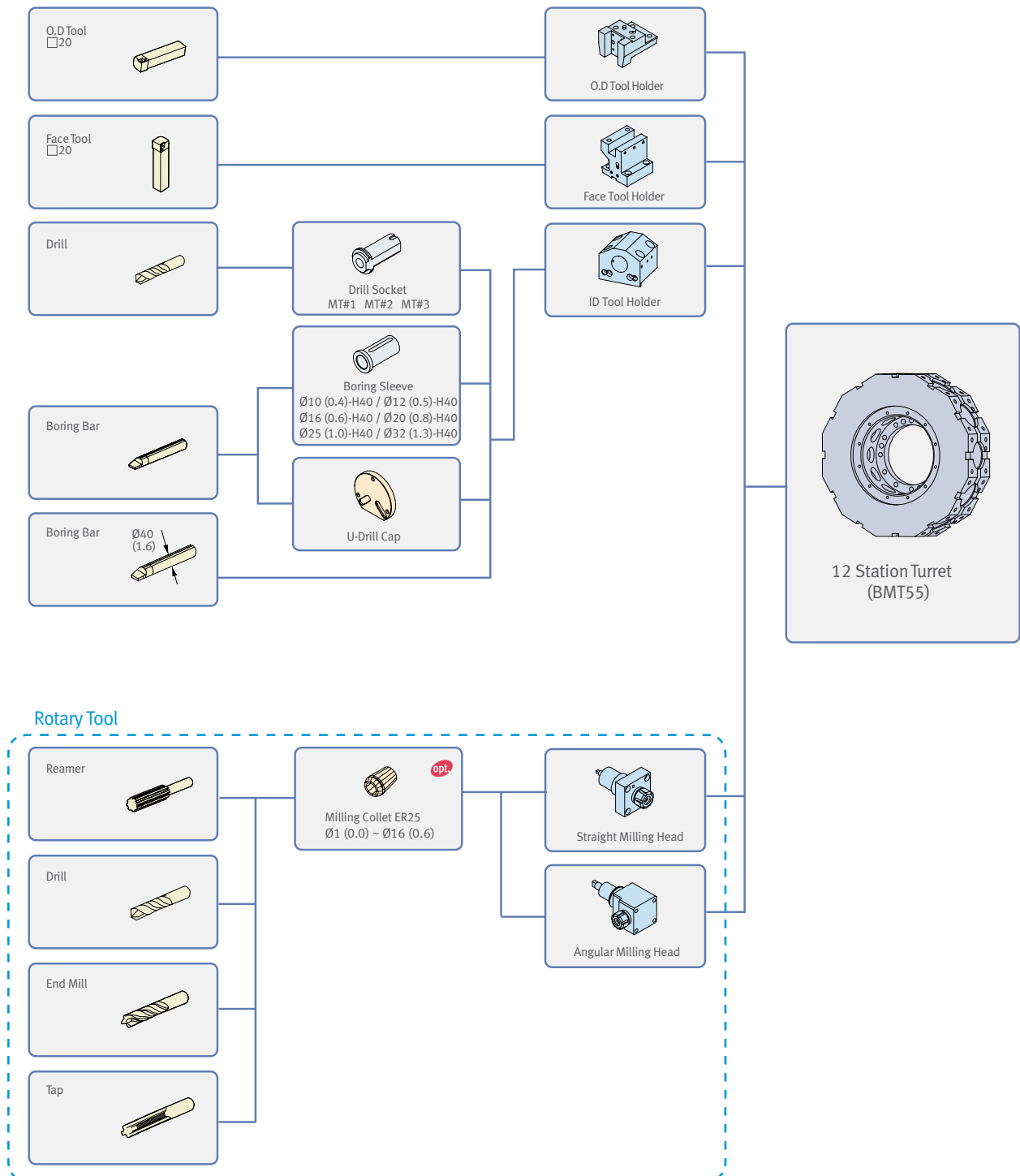


Note) Above tooling system is our recommendation. Depending on export condition, the standard tooling packed with the machine can be different.

# Tooling System

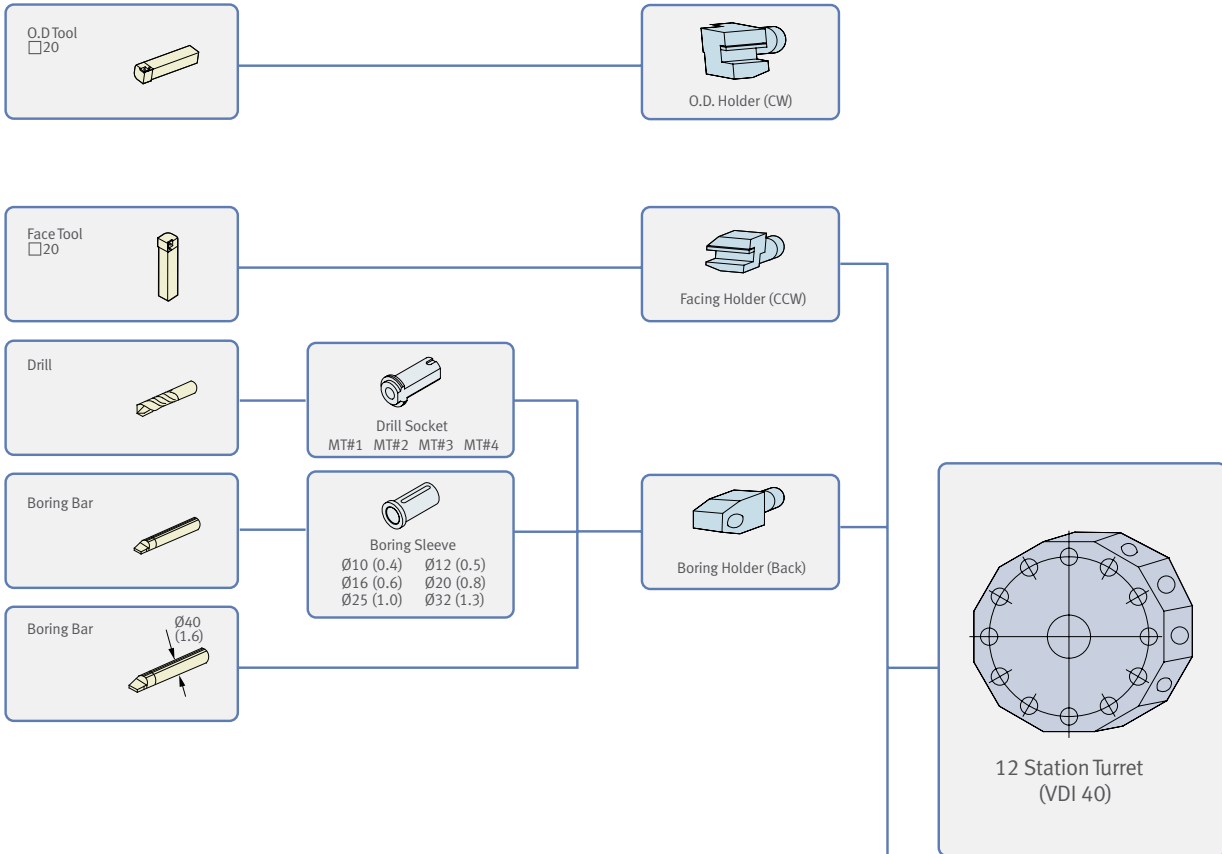
unit : mm (inch)

## PUMA H250TM / QL200HM

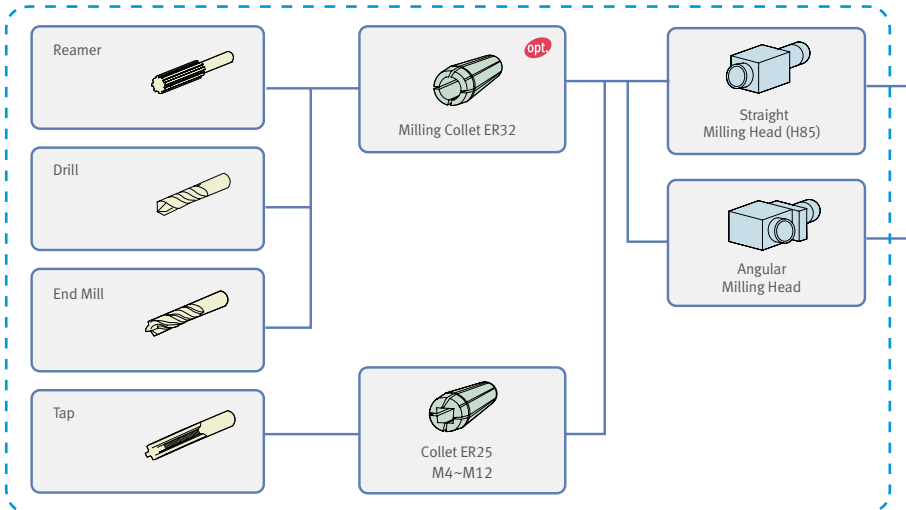


Note) Above tooling system is our recommendation. Depending on export condition, the standard tooling packed with the machine can be different.

# PUMA H310TM / QL300HM



## Rotary Tool

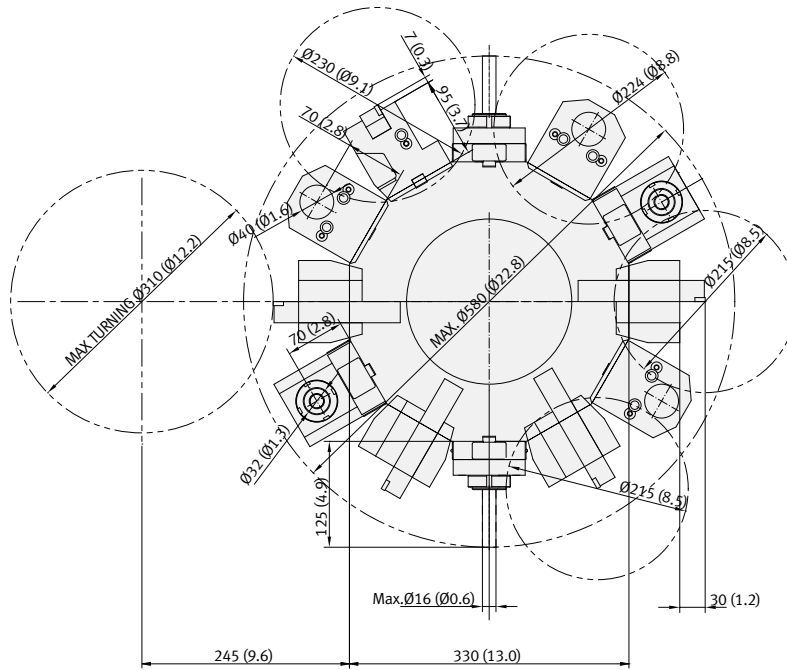


Note) Above tooling system is our recommendation. Depending on export condition, the standard tooling packed with the machine can be different.

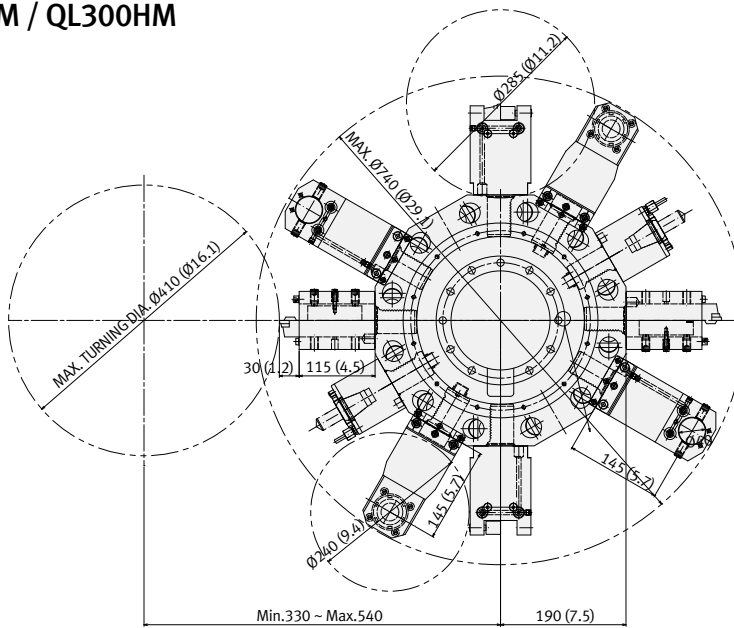


unit : mm ( inch )

### PUMA H250TM / QL200HM



### PUMA H310TM / QL300HM

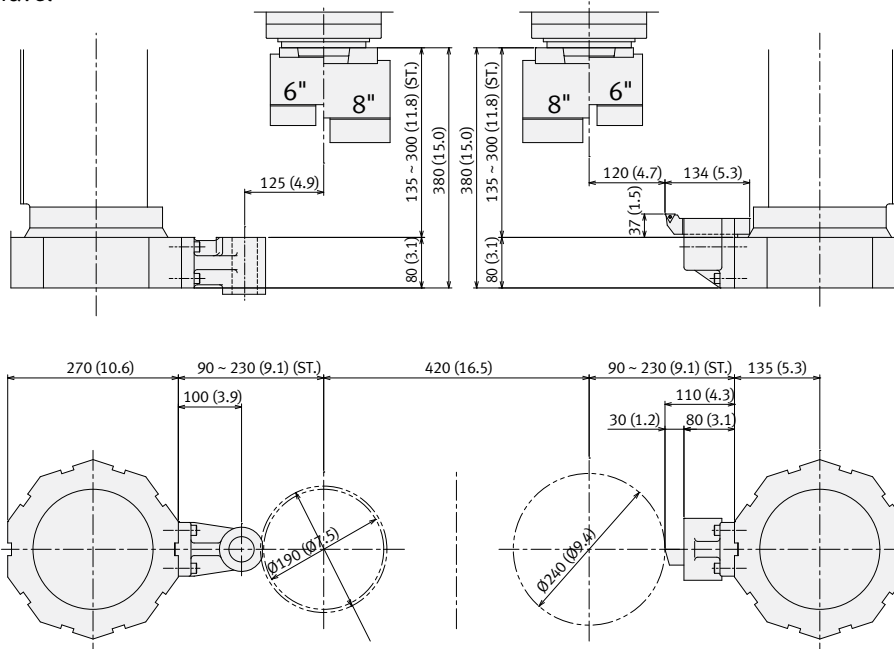


# Working Range

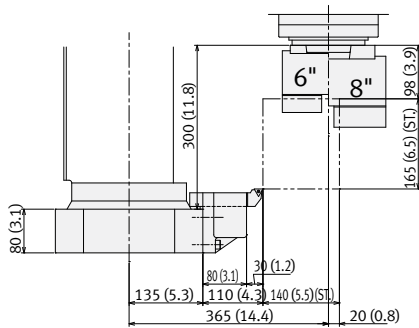
unit : mm (inch)

## PUMA HT230T / HT230TG

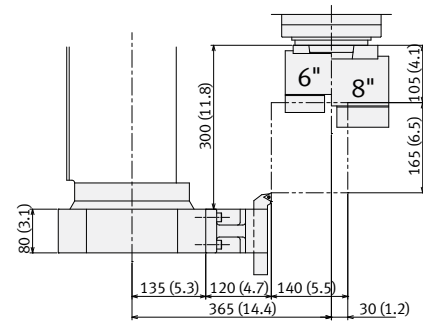
Axis Travel



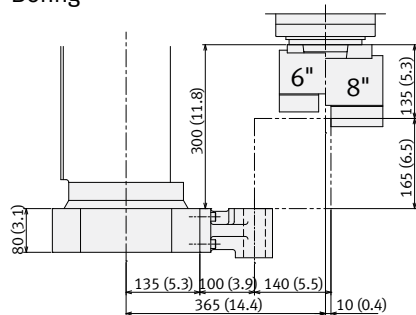
O.D Cutting



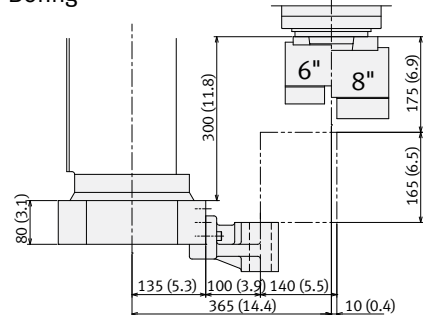
Face Cutting



Boring



Boring

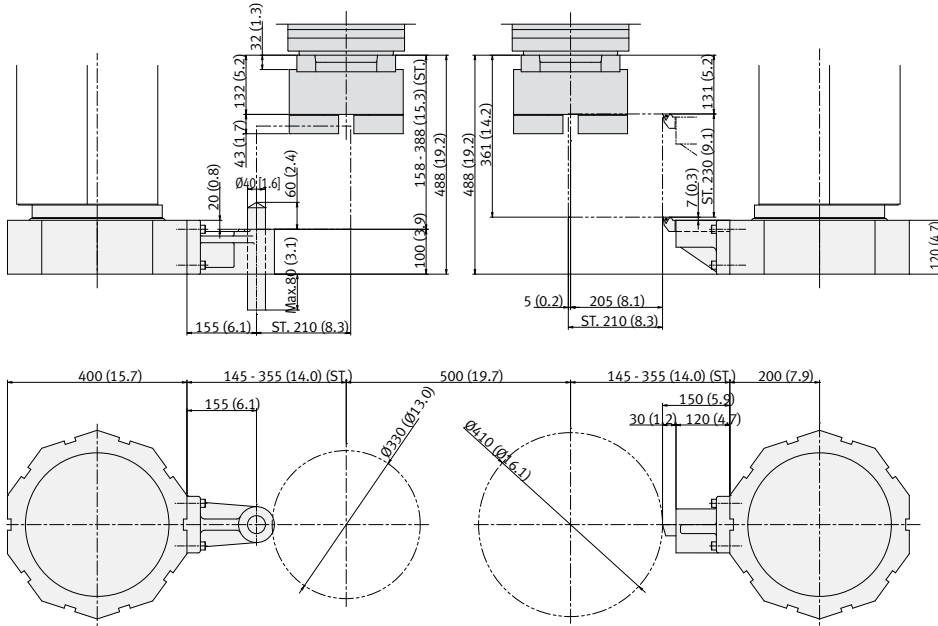




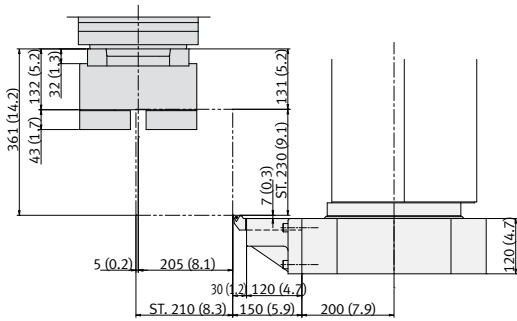
# PUMA H310T / QL300H

unit : mm (inch)

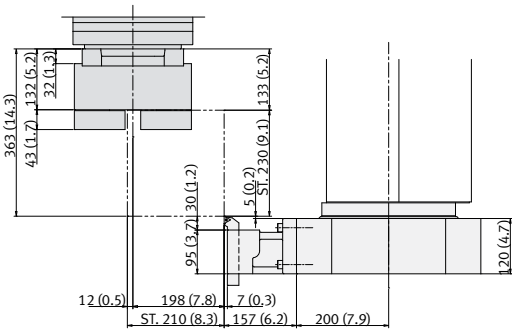
## Axis Travel



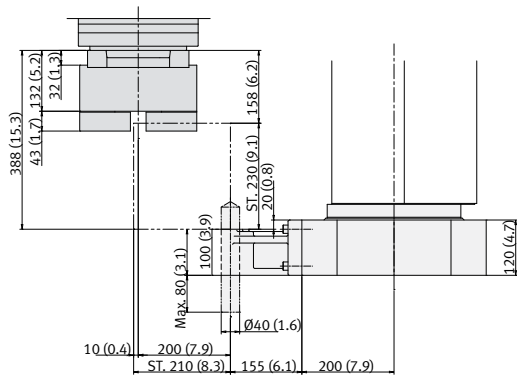
## O.D Cutting



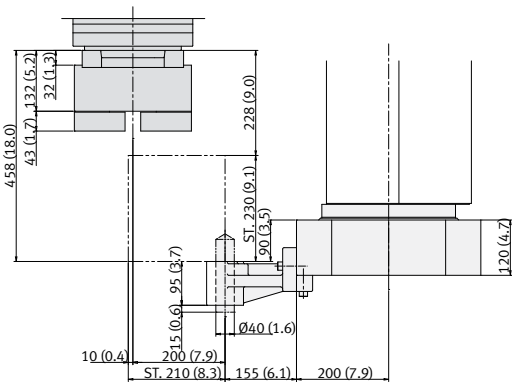
## Face Cutting



## Boring



## Boring

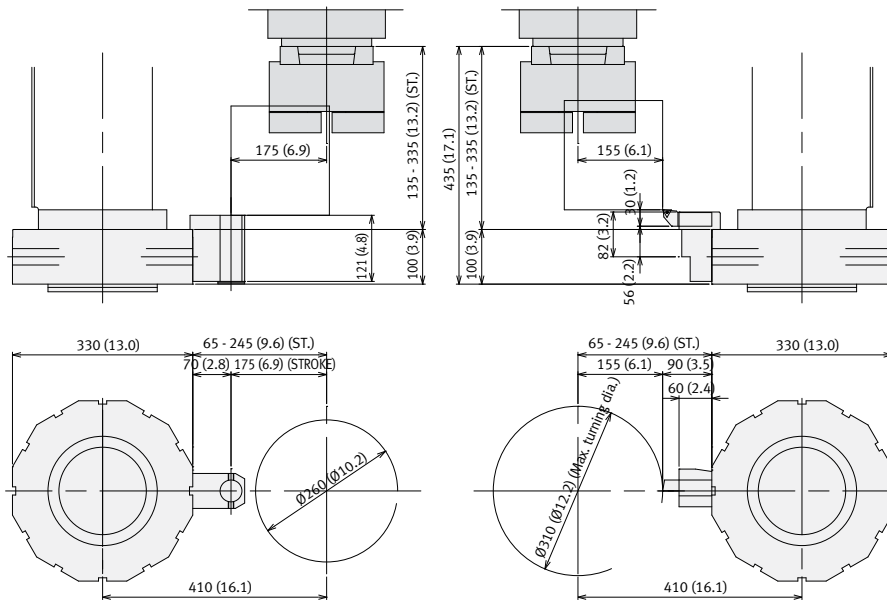


# Working Range

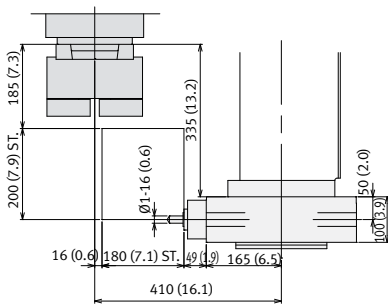
unit : mm (inch)

## PUMA H250TM / QL200HM

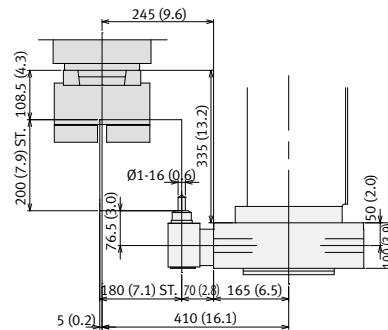
### Axis Travel



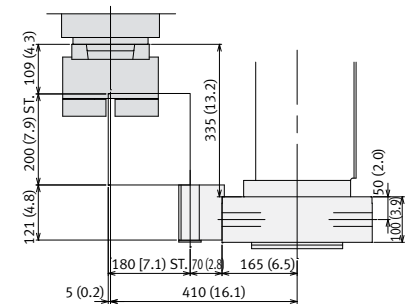
### O.D Cutting



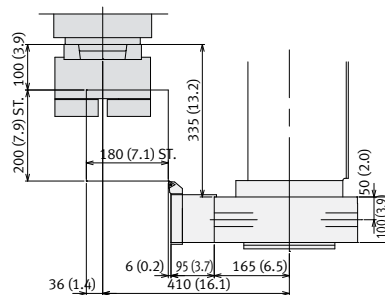
### Face Cutting



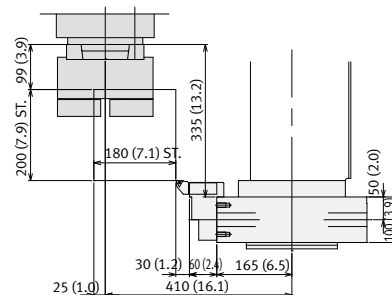
### Boring



### Angular milling head

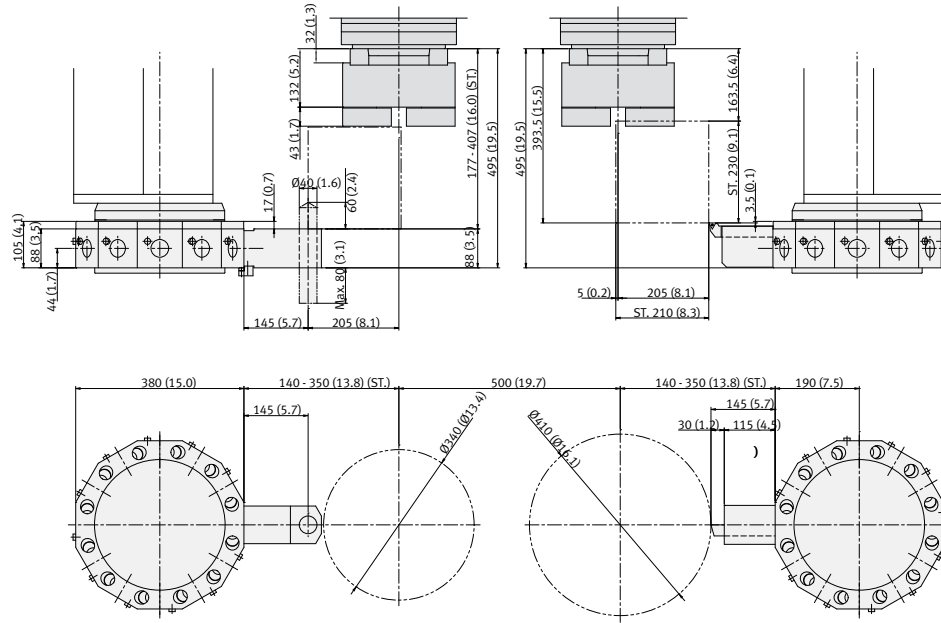


### Straight milling head

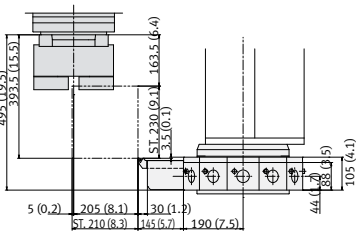


# PUMA H310TM / QL300HM

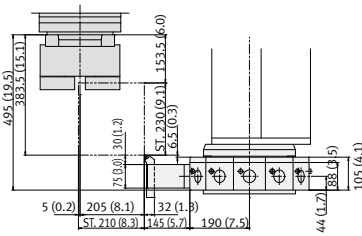
## Axis Travel



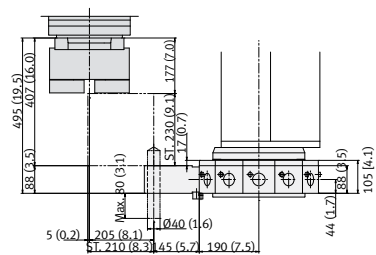
## O.D Cutting



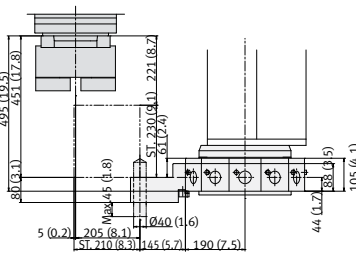
## Face Cutting



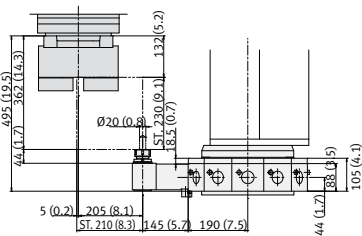
## I.D (Cutting)



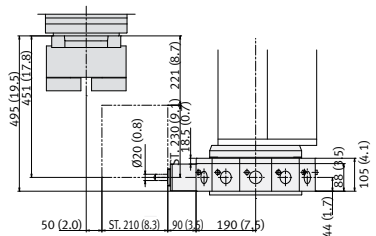
## I.D (OFFSET) Cutting



## Angular milling head



## Straight milling head

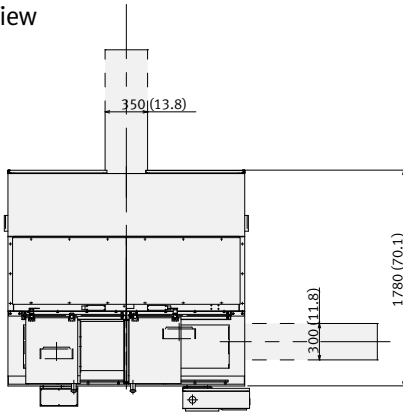


# External Dimension

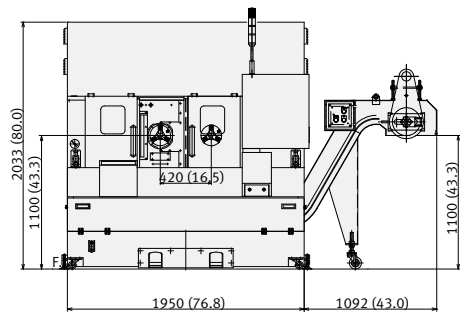
unit : mm (inch)

## PUMA HT230T

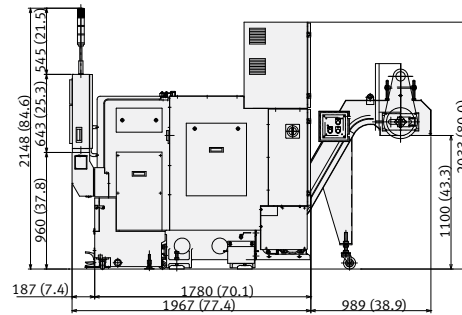
Top View



Front View

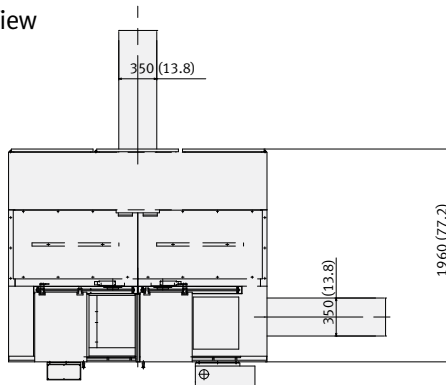


Side View

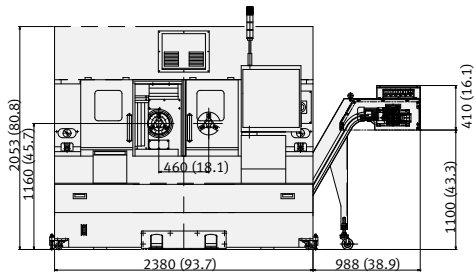


## PUMA H250TM

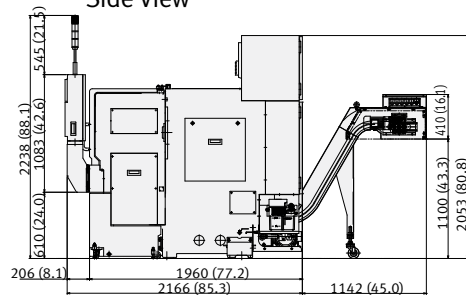
Top View



Front View



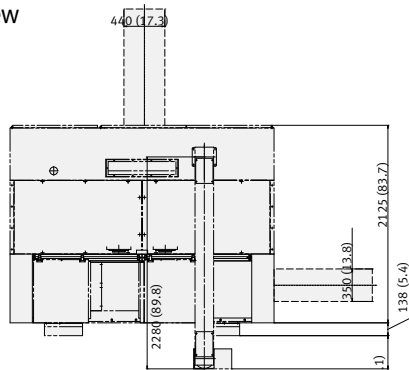
Side View



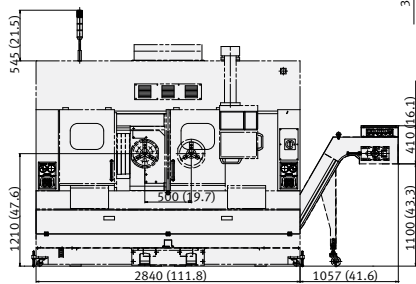
unit : mm ( inch )

### PUMA H310T / 310TM

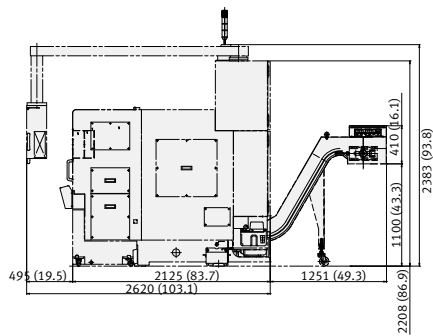
Top View



Front View

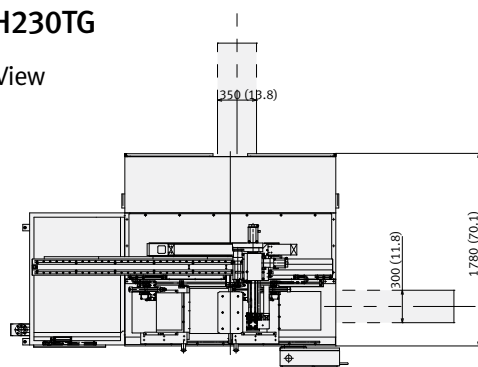


Side View

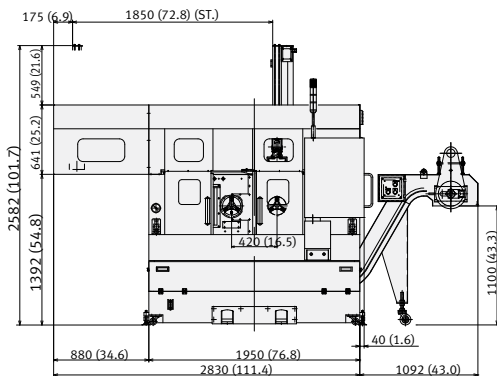


### PUMA H230TG

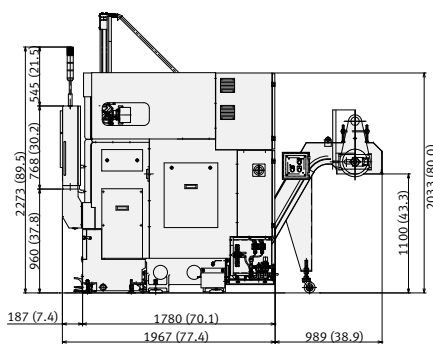
Top View



Front View



Side View



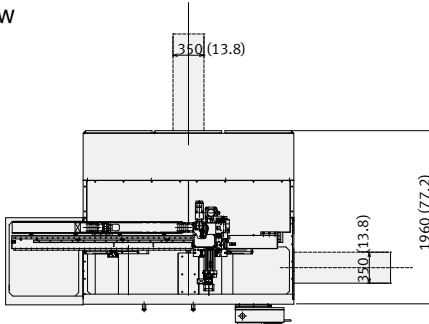
This picture is for A1-type gantry loader application

# External Dimension

unit : mm (inch)

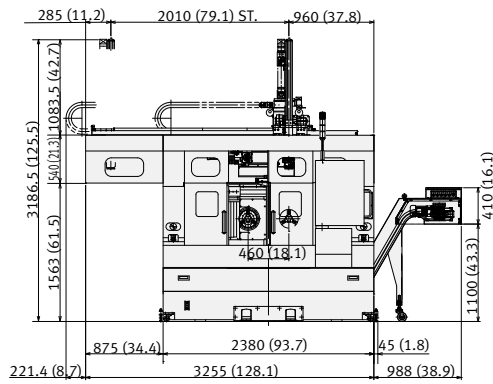
## PUMA QL200HM

Top View

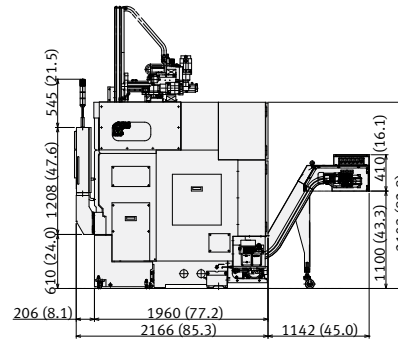


This picture is for A1-type gantry loader application

Front View

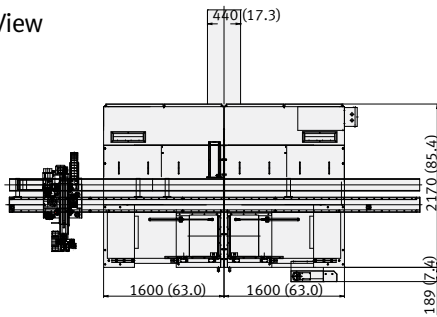


Side View



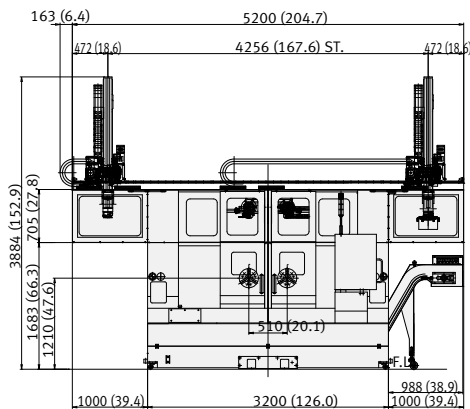
## PUMA QL300H / QL300HM

Top View

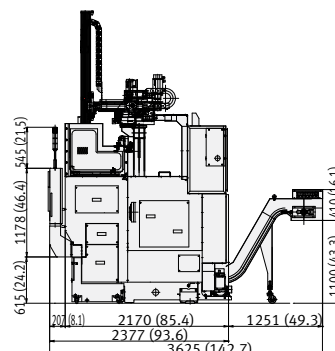


This picture is for A3-type gantry loader application

Front View



Side View



# Machine Specifications

	Description	Unit	PUMA HT230T [HT230TG]	PUMA H310T [QL300H]	PUMA H250TM [QL200HM]	PUMA H310TM [QL300HM]
Capacity	Distance of spindle centers	mm (inch)	420 (16.5)	500 (19.7)	460 (18.1)	500 (19.7)
	Recommendable turning dia.	mm (inch)	Ø170 (6.7)	Ø255 (10.0)	Ø210 (8.3)	Ø255 (10.0)
	Max. turning dia.	mm (inch)	Ø240 (9.4)	Ø410 (16.1)	Ø310 (12.2)	Ø410 (16.1)
	Max. turning length	mm (inch)	160 (6.3)	230 (9.1)	160 (6.3)	230 (9.1)
Travels	X / Z-axis travel	mm (inch)	140 / 165 (5.5 / 6.5)	210 / 230 (8.3 / 9.1)	180 / 200 (7.1 / 7.9)	210 / 230 (8.3 / 9.1)
	X / Z-axis rapid traverse	m/min (ipm)	24 / 24 (944.9 / 944.9)			
Spindle (Left / Right)	Max. spindle speed	r/min	4500	3500	4500	3500
	Spindle nose	ASA	A2-5	A2-8	A2-6	A2-8
	Spindle bearing dia. (front)	mm (inch)	Ø90 (3.5)	Ø120 (4.7)	Ø100 (3.9)	Ø120 (4.7)
	Spindle bore dia.	mm (inch)	Ø55 (2.2)	Ø77 (3.0)	Ø62 (2.4)	Ø77 (3.0)
	C-axis indexing	deg	-		360° (in 0.001° increment)	
Turret	Turret type		V10		BMT55	VDI40
	No. of tool station	st	10+10		12+12	
	OD tool size (Max.)	mm (inch)	25 (1.0)		25 (1.0)	
	Boring bar dia. (Max.)	mm (inch)	Ø40 (1.6)		Ø40 (1.6)	Ø40 (1.6)
	Indexing time (1-station swivel)	s	0.25	0.35	0.28	0.35
	Rotary tool spindle speed (Max.)	r/min	-		3000	
Motors	Main spindle motor	kW (Hp)	11 [7.5] (14.8 [10.1])	18.5 (24.8)	11 (14.8)	18.5 (24.8)
	Rotary tool spindle motor (15min.)	kW (Hp)	-		2.8 (3.8)	4.0 (5.4)
	Servo motor (X / Z-axis)	kW (Hp)	1.2 / 1.2 [1.0 / 1.2] (1.6 / 1.6 [1.3 / 1.6])	3.0 / 3.0 (4.0 / 4.0)	1.2 / 1.6 (1.6 / 2.1)	3.0 / 3.0 (4.0 / 4.0)
	Coolant pump	kW (Hp)	0.4			
Power source	Electric power supply (Rated capa.)	kVA	25	60 [70]	40	70 [80]
Machine Dimensions	height	mm (inch)	2033 (80.0)	2383 (93.8)	2103 (82.8)	2383 (93.8)
	Length	mm (inch)	1950 (76.8)	2840 (111.8)	2380 (93.7)	2840 (111.8)
	Width	mm (inch)	1780 (70.1)	2125 (83.7)	1960 (77.2)	2125 (83.7)
	Weight	kg (lb)	3700 (8157.0)	7800 (17195.8)	5200 (11463.9)	7800 (17195.8)

[ ] : The machine with Gantry Loader

## HT series

### Standard Feature

- Chuck clamp confirmation
- Coolant pump for main turret
- Hydraulic pump
- Level bolt & plate
- Soft jaw
- Tool post (hydraulic type)
- Work light

### Optional Feature

- 3 Color signal tower
- Additional MPG
- Air blower for chuck (air blaster)
- Air conditioner
- Air gun
- Automatic front door
- Automatic power off
- Chip bucket type
- Chip conveyor type
- Chuck coolant (coolant blaster)
- Coolant gun
- Coolant pressure switch
- Doosan tool monitoring system
- Electric cabinet light
- Electric line filter
- Electric power transformer
- Extra M code
- Flushing coolant
- Hardened & ground hard jaws
- High coolant interface
- Mist collector
- Oil skimmer
- Robot interface
- Shunt trip coil
- Through Spindle Coolant (coolant / air)
- Tool setter (removable)
- U drill holder
- Work & tool counter
- Work locating confirmation (air limit sensing)

- The specifications and information above-mentioned may be changed without prior notice.
- For more details, please contact Doosan.

# Gantry Loader Specifications

Description		Unit	PUMA HT230TG			PUMA QL200HM			PUMA QL300H/HM		
Gantry loader application type			A1-type	A2-type	A3-type	A1-type	A2-type	A3-type	A1-type	A2-type	A3-type
Capacity	Max. work dia. x length	mm (inch)	Ø140 x 100 (5.5 x 3.9)			Ø160 x 100 (6.3 x 3.9)			Ø250 x 85 (9.8 x 3.3)		
	Max. work weight	kg (lb)	3 (6.6)			5 (11.0)			8 (17.6)		
Standard loading time		s	7			10			13		
Slide module	X-axis stroke (left-right)	mm (inch)	1850 (72.8)	3280 (129.1)		2010 (79.1)	2010 (79.1)	3580 (140.9)	3105 (122.2)	3105 (122.2)	4520 (178.0)
	Y-axis stroke (up-down)	mm (inch)	545 (21.5)			700 (27.6)			945 (37.2)		
	Z-axis stroke (front-rear)	mm (inch)	180 (7.1)			200 (7.9)			200 (7.9)		
	Loading capacity (Gripper+workpiece mass)	kg (lb)	15 (33.1)			25 (55.1)			40 (88.2)		
	Max. Speed (X / Y / Z-axis)	m/min (ipm)	150 / 120 / 50 (5905.5 / 4724.4 / 1968.5)			150 / 110 / 50 (5905.5 / 4330.7 / 1968.5)			150 / 120 / 50 (5905.5 / 4724.4 / 1968.5)		
	Servo motor power (X / Y / Z-axis)	kW	0.75 / 0.75 / 0.5			1.4 / 1.4 / 0.5			1.6 / 1.6 / 0.75		
Gripper head	Gripper		2 sets of Double 3-jaw chuck type with individual spring pusher								
	Wrist swivel angle	deg	180			180			180		
	Swivel time (per every 180°)	s	0.5			0.6			1		
	Jaw stroke	mm (inch)	16 (0.6)			20 (0.8)			20 (0.8)		
	Gripping force (Max./each chuck)	N	1040			1850			1850		
Turn around module	Gripper		2 sets of Double 3-jaw chuck type with individual spring pusher								
	Distance between center	mm (inch)	420 (16.5)			460 (18.1)			510 (20.1)		
	Shifting distance (Max.)	mm (inch)	245 (9.6)			260 (10.2)			320 (12.6)		
	Gripper rotating angle	deg	90			90			90		
Work stocker	Number of pallets	st.	16 (A3 TYPE : 16 x 2)								
	Number of lifting device		Left	Right	Double	Left	Right	Double	Left	Right	Double
	Allowable work dia. x length (Min.)	mm (inch)	Ø50~Ø150 (Ø2.0~Ø5.9)			Ø25~Ø160 (Ø1.0~Ø6.3)			Ø50~Ø250 (Ø2.0~Ø9.8)		
	Allowable work loading (Max./pallet)	kg (lb)	40 (88.2)			71 (156.5)			150 (330.7)		
	Min. allowable work height	mm (inch)				15 (0.6)					
Power source	Electric power supply (Rated capa.)	kVA	30			40			70		
Machine Dimensions	Machine height (Max./Min.)	mm (inch)	{ 2582/2037 } (101.6/80.2)			{ 3187/2487 } (125.5/97.9)			{ 3746/3020 } (147.5/118.9)		
	w/o chip conveyor	mm (inch)	2830 x 1780 (111.4 x 70.1)	3020 x 1780 (118.9 x 70.1)	3900 x 1780 (153.5 x 70.1)	3255 x 1960 (128.1 x 77.2)	3255 x 1960 (128.1 x 77.2)	4130 x 1960 (162.6 x 77.2)	5000 x 2377 (196.9 x 93.6)	5000 x 2377 (196.9 x 93.6)	5200 x 2377 (204.7 x 93.6)
	with side chip conveyor	mm (inch)	3922 x 1780 (154.4 x 70.1)	4112 x 1780 (161.9 x 70.1)	-	4243 x 1960 (167.0 x 77.2)	4243 x 1960 (167.0 x 77.2)	-	6130 x 2377 (241.3 x 93.6)	6130 x 2377 (241.3 x 93.6)	-
	with rear chip conveyor	mm (inch)	2830 x 2769 (111.4 x 109.0)	3020 x 2769 (118.9 x 109.0)	3900 x 2769 (153.5 x 109.0)	3255 x 2945 (128.1 x 115.9)	3255 x 2945 (128.1 x 115.9)	4130 x 2945 (162.6 x 115.9)	5000 x 3895 (196.9 x 153.3)	5000 x 3895 (196.9 x 153.3)	5200 x 3895 (204.7 x 153.3)
	Machine weight (exclude stocker and chip conveyor)	kg (lb)	4100 (9038.8)			5800 (12786.6)			9000 (19841.3)		

{ } : Option

## QL series

### Standard Feature

- 3 Color signal tower
- Air blower for chuck (Air blaster)
- Chuck clamp confirmation
- Chuck coolant (coolant blaster)
- Coolant pump for main turret
- Gantry loader type
- Gantry top door
- Hydraulic pump
- Level bolt & plate
- MPG
- Protect cover
- Soft jaw
- Tool post (hydraulic type)
- Turn over unit
- Work light

### Optional Feature

- Air conditioner
- Air gun
- Automatic power off
- Chip bucket type
- Chip conveyor type
- Chute for workpiece inspection
- Coolant gun
- Coolant pressure switch
- Doosan tool monitoring system
- Electric cabinet light
- Electric line filter
- Electric power transformer
- Extra M code
- Flushing coolant
- Gantry Loader Stocker
- Hardened & ground hard jaws
- High coolant interface
- Mist collector
- Oil skimmer
- Shunt trip coil
- Through Spindle Coolant (coolant / air)
- Tool setter (removable)
- Work & tool counter
- Work locating confirmation (air limit sensing)

• The specifications and information above-mentioned may be changed without prior notice.  
 • For more details, please contact Doosan.



# NC Unit Specifications

## Fanuc i series

### AXES CONTROL

- Controlled axes	4 [ X, Z+X, Z ] axes
- Simultaneous controlled axes	4 [ 2+2 ] axes
- Backlash compensation	0 ~ ±9999 pulses
- Backlash compensation for each rapid traverse and cutting feed	
- Chamfering on/off	
- Emergency stop	
- Fine Acc & Dec control	
- Follow-up	
- HRV2 control	
- Inch / Metric conversion	
- Increment system 1/10	0.0001 / 0.00001 mm/inch
- Interlock	All axis / each axis
- Least input command	0.001 / 0.0001 mm/inch
- Machine lock	All axis / each axis
- Mirror image	
- Overtravel	
- Position switch	
- Servo off	
- Stored stroke check 1	
- Stroke limit check before move	
- Unexpected disturbance torque detection function	

### OPERATION

- Automatic operation (memory)	
- Buffer register	
- DNC operation	(Reader / puncher interface is required)
- Dry run	
- Handle incremental feed	X1, X10, X100
- Manual handle interruption	
- JOG feed	
- Manual handle feed	1 unit
- Manual intervention and return	
- Manual pulse generator	1 ea
- Manual reference position return	
- Program number search	
- Program restart	
- Sequence number search	

### INTERPOLATION FUNCTIONS

- 1st. reference position return	Manual, G28
- 2nd. reference position return	G30
- Continuous thread	
- Dwell (per sec)	G04
- High speed skip	
- Linear interpolation	G01
- Multiple threading	
- Positioning	G00
- Reference position return check	G27
- Thread cutting / Synchronous cutting	
- Thread cutting retract	
- Torque limit skip	
- Variable lead threading	

### FEED FUNCTION

- Automatic acceleration / deceleration	
- Cutting feedrate clamp	
- Feed per minute	
- Feed per revolution	
- Feedrate override (10% unit)	0 - 200 %
- Jog feed override (10% unit)	0 - 2000 mm/min
- Manual per revolution feed	
- Override cancel	
- Rapid traverse override	F0, 25, 100 %
- Tangential speed constant control	

### AUXILIARY / SPINDLE SPEED FUNCTION

- Spindle orientation	
- Actual spindle speed output	
- Auxiliary function lock	
- Constant surface speed control	
- High speed M / S / T interface	
- M - code function	M3 digits
- S - code function	S4 / S5 digits
- Spindle serial output	S4 / S5 digits
- Spindle speed override	0 - 150 %

### PROGRAM INPUT

- Absolute / incremental programming	
- Addition of custom macro common variables	
- Automatic coordinate system setting	
- Canned cycle for drilling	
- Canned cycle for turning	
- Circular interpolation by R programming	
- Control in / out	
- Coordinate system setting	G50
- Coordinate system shift	
- Custom macro	
- Decimal point programming	
- Diameter / radius programming (X axis)	
- Direct drawing dimension programming	
- G code system A / B / C	
- Input unit 10 time multiply	
- Label skip	
- Manual absolute on and off	
- Maximum program dimension	±9 digit
- Multiple repetitive canned cycle II	
- Optional block skip	9 piece
- Parity check	
- Plane selection	G17, G18, G19
- Program number	O4 digit
- Program stop / end (M00, M01 / M02, M30)	
- Programmable data input	G10
- Sequence number	N5 digit
- SUB program call	4 folds nested
- Tape code : ISO / EIA auto recognition	EIA RS422 / ISO840
- Tape format for FANUC Series 15	
- Work coordinate system	G52 - G59

### TOOL FUNCTION / TOOL COMPENSATION

- Automatic tool offset	
- Direct input of offset value measured B	
- T-code function	T2+2 digits
- Tool geometry / wear compensation	
- Tool life management	
- Tool nose radius compensation	
- Tool offset	G43, G44, G49
- Tool offset pairs	64 pairs

### EDITING OPERATION

- Back ground editing	
- Extended part program editing	
- Number of registered programs	400 ea
- Part program editing	
- Part program storage length	1280 m
- Play back	
- Program protect	

### SETTING AND DISPLAY

- Actual cutting feedrate display	
- Alarm display	
- Alarm history display	
- Current position display	
- Directory display and punch for each group	
- Directory display of floppy cassette	
- Display of spindle speed and T code at all screens	
- External message display	
- Help function	
- Multi-language display	
- Operation history display	
- Parameter setting and display	
- Program name display	31 characters
- Run hours / part count display	
- Self-diagnosis function	
- Servo setting screen	
- Spindle setting screen	
- Status display	

### DATA INPUT / OUTPUT

- External data input	
- External key input	
- External program input	
- External program number search	
- External work number search	
- Memory card input/output	
- Reader/puncher interface	CH1. interface
- RS232C interface	

### OTHER

- Cycle start and lamp	
- Display unit	10.4" Color LCD / MDI
- Feed hold and lamp	
- NC and servo ready	
- PMC system	
- EZ guide i (Conversational programming solution)	
- Ethernet function	

# NC Unit Specifications

## Fanuc 31i

### AXES CONTROL

- Controlled path of HT230T / H250TM / H310T / H310TM	2 path
- Controlled path of HT230TG / QL200HM / QL300H / QL300HM	2+1 path
- Controlled axes of HT230T / H310T / HT230TG / Q300H	4 [ 2+2 ] axes
- Controlled axes of H250TM / H310TM / QL200HM / QL300HM	8 [ 4+4 ] axes
- Simultaneous Controlled axes of HT230T / H310T / HT230TG / Q300H	4 [ 2+2 ] axes
- Simultaneous Controlled axes of H250TM / H310TM / QL200HM / QL300HM	6 [ 3+3 ] axes
- Axis control by PMC	
- Backlash compensation	0 ~ ±9999 pulses
- Backlash compensation for each rapid traverse and cutting feed	
- Position switch	
- Chamfering on / off	
- Emergency stop	
- Fine Acc & Dec control	
- Follow-up	
- High speed HRV control	
- HRV2 control	
- Inch / Metric conversion	
- Interlock	All axis / each axis
- Least input command	0.001 / 0.0001 mm/inch
- Machine lock	All axis / each axis
- Mirror image	
- Overtravel	
- Servo off	
- Stored stroke check 1	
- Unexpected disturbance torque detection function	

### OPERATION

- Automatic operation ( memory )	
- Buffer register	
- Dry run	
- Handle incremental feed	X1, X10, X100
- JOG feed	
- Manual intervention and return	
- Manual pulse generator	1 ea
- Manual reference position return	
- MDI operation	
- Program number search	
- Sequence number search	
- Single block	

### INTERPOLATION FUNCTIONS

- 1st. reference position return	Manual, G28
- 2nd. reference position return	G30
- Circular interpolation	G02
- Continuous threading	
- Dwell ( per sec )	G04
- Linear interpolation	G01
- Multiple threading	
- Reference position return check	G27
- Skip	G31
- Thread cutting / Synchronous cutting	
- Thread cutting retract	
- Torque limit skip	

### FEED FUNCTION

- Automatic acceleration / deceleration	
- Cutting feedrate clamp	
- Feed per minute	
- Feed per revolution	
- Feedrate override ( 10% unit )	0 - 200 %
- Jog feed override ( 10% unit )	0 - 2000 mm/min
- Manual per revolution feed	
- Override cancel	
- Rapid traverse override	F0, 25, 100 %
- Rapid traverse rate	
- Tangential speed constant control	

### AUXILIARY / SPINDLE SPEED FUNCTION

- Spindle orientation	
- Auxiliary function lock	
- Constant surface speed control	G96
- M - code function	M3 digits
- Rigid tapping	
- S - code function	S4 / S5 digits
- Spindle serial output	S4 / S5 digits
- Spindle speed override	0 - 150 %

### PROGRAM INPUT

- Absolute / incremental programming	
- Automatic coordinate system setting	
- Canned cycle for drilling	
- Canned cycle for turning	
- Circular interpolation by R programming	
- Control in/out	
- Coordinate system setting	G50
- Coordinate system shift	
- Custom macro	
- Macro executor	
- Decimal point programming / pocket calculator type decimal point programming	
- Diameter/radius programming ( X axis )	
- Direct drawing dimension programming	
- Direct input of coordinate system shift	
- G code system A	
- Input unit 10 time multiply	
- Label skip	
- Manual absolute on and off	
- Maximum program dimension	±9 digit
- Multiple repetitive canned cycle	G70 - G76
- Multiple repetitive canned cycle II	
- Optional block skip	9 piece
- Parity check	
- Plane selection	G17, G18, G19
- Program number	O4 digit

- Program stop / end ( M00, M01 / M02, M30 )	
- Programmable data input	G10
- Sequence number	N5 digit
- SUB program call	10 folds nested
- Tape code : ISO / EIA auto recognition	EIA RS422 / ISO840
- Work coordinate system	G52 - G59

### TOOL FUNCTION / TOOL COMPENSATION

- Automatic tool offset	
- Direct input of offset value measured	
- Direct input of offset value measured B	
- T-code function	T2+2 digits
- Tool geometry / wear compensation	
- Tool life management	
- Tool nose radius compensation	
- Tool offset	G43, G44, G49
- Tool offset pairs	±6 digits : 64 pairs
- Tool offset value counter input	

### EDITING OPERATION

- Back ground editing	
- Extended part program editing	
- Number of registered programs	500 ea
- Part program editing	
- Part program storage length	640 m
- Program protect	

### SETTING AND DISPLAY

- Actual cutting feedrate display	
- Alarm display	
- Alarm history display	
- Current position display	
- Display of spindle speed and T code at all screens	
- Help function	
- Multi-language display	
- Operation history display	
- Parameter setting and display	
- Run hours / part count display	
- Self-diagnosis function	
- Servo setting screen	
- Spindle setting screen	
- Status display	

### DATA INPUT / OUTPUT

- External key input	
- External work number search	15 points
- Memory card input / output	
- Reader / puncher interface	CH1. interface
- RS232C interface	

### OTHER

- Cycle start and lamp	
- Display unit	10.4" Color TFT LCD
- Feed hold and lamp	
- NC and servo ready	
- PMC system	
- Reset / rewind	

### INTERFACE FUNCTION

- Ethernet function	Embedded ethernet
---------------------	-------------------

### OPTIONAL SPECIFICATIONS

- Controlled axes expansion ( Total )	Max.8 [ 4+4 ] axes
- Stored stroke 2 and 3	
- DNC operation ( Reader / puncher interface is required )	
- Manual handle feed	2 units
- Manual handle interruption	
- Reference position shift	
- Tool retract and recover	
- 3rd / 4th reference point return	
- Circular threading	
- Multi step skip	
- Variable lead threading	
- Advanced preview control	
- External deceleration	
- Feed forward function	
- Feed stop	
- Addition of workpiece coordinate system pair	48 pairs
- Optional block skip ( soft operator's panel )	9 piece
- Pattern data input	
- Work coordinate system preset	
- Addition of tool pairs for tool life management	128 pairs
- Tool load monitoring system	
- Tool offset pairs	64 / 99 / 200 / 400 / 999 / 2000 pairs
- Number of registered programs & Part program storage length	1280 M ( 512KB ) - 1000 ea 2560 M ( 1MB ) - 1000 ea 5120 M ( 2MB ) - 1000 ea 10240 M ( 8MB ) - 1000 ea 20480 M ( 8MB ) - 1000 ea 2560 M ( 1MB ) - 2000 ea 5120 M ( 2MB ) - 4000 ea 10240 M ( 4MB ) - 4000 ea 20480 M ( 8MB ) - 4000 ea
- Play back	
- Directory display of floppy cassette	



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